Lecture
Module 9: Biotic Communities

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Learning Objectives

Upon completion of this module, the participant will be able to:

1. Describe the various levels of biological diversity as related to the landscape features and processes.

2. Describe some of the primary and secondary factors affecting the distribution of organisms on the landscape.

3. Describe biotic community dynamics in relation to natural environmental forces.

4. Describe how biotic community dynamics relate to natural resource management alternatives.

Lecture Outline

Objectives
Definitions
Numbers of species and extinction rates
Reasons for species decline
    Habitat loss and fragmentation
    Introduction of exotic organisms
    Over exploitation
    Natural causes
Concepts necessary for managers to understand in order to conserve species
    Species richness
    Patterns of species richness
        Geographic factors (latitude, altitude, depth)
        Environmental productivity
        Environmental heterogeneity
        Climatic variability
        Age of the environment
        Environmental harshness
Implications for conservation planning
    Some areas are more important than others
    Importance of private lands

Rare ecosystems (wetlands, tall grass prairie, late-successional stage forest)
Planning on a watershed scale

Exercises

Field or Classroom Exercises

1. Develop a list of threatened and endangered species for your state. The local office of the U.S. Fish and Wildlife Service or your state fish and wildlife agency can help you with this. What are the reasons these species originally declined? Are there patterns of species endangerment (types of species, causes of decline, or habitats or localities that form a pattern for why these species need protection)? Obtain a recovery plan for one of these species. What specific management actions are required to recover the species and what level of conservation (genetic, population, community, landscape) are these actions targeting?

2. On land that you manage or are familiar with identify a community of organisms. List as many of these organisms as you can. What functional roles (i.e., predator, herbivore, decomposer, etc.) do each of these species play in your community? What might happen if an invasive organism (plant or animal) was introduced into your community? What might happen if the apex predator(s) was removed?

3. Think about species richness for a taxa of organisms (i.e., mammals, birds, reptiles, amphibians) in your state or region. What are some of the factors that determine the number of species? Which of any of these factors are subject to management? What can we do about the other factors if species richness is important to society?

4. On property that you manage or are familiar with, map the vegetation associations. You can use an aerial photograph for this purpose. For each vegetation association make a list of the characteristics (different vegetation layers, logs, snags, etc.) that determine the structural diversity of these associations. Is species richness on this property related to the vegetation associations? Why or why not?

5. Think about a watershed you are familiar with. Based on the information obtained in this course and using species richness as an environmental indicator of conservation priorities, what are the priority areas that you might recommend for conservation or restoration efforts? What are the constraints to applying conservation efforts to priority areas in this manner? Why might species richness be a poor metric to use in determining conservation priorities?

Study Questions

1. Explain how geographic and environmental factors affect species richness and productivity. In what habitat type are the most numbers of species found on earth and why?

2. Why are private lands an important consideration for biological conservation goals?

References and Selected Reading

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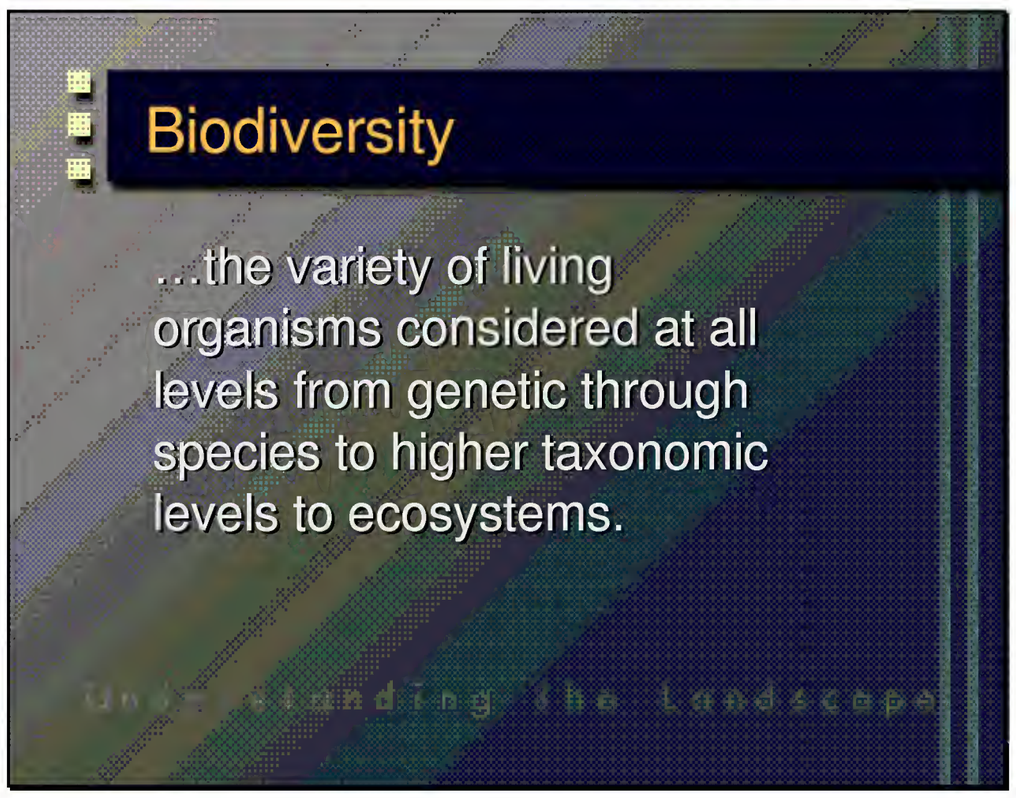
Slides used in lecture

Slide 1



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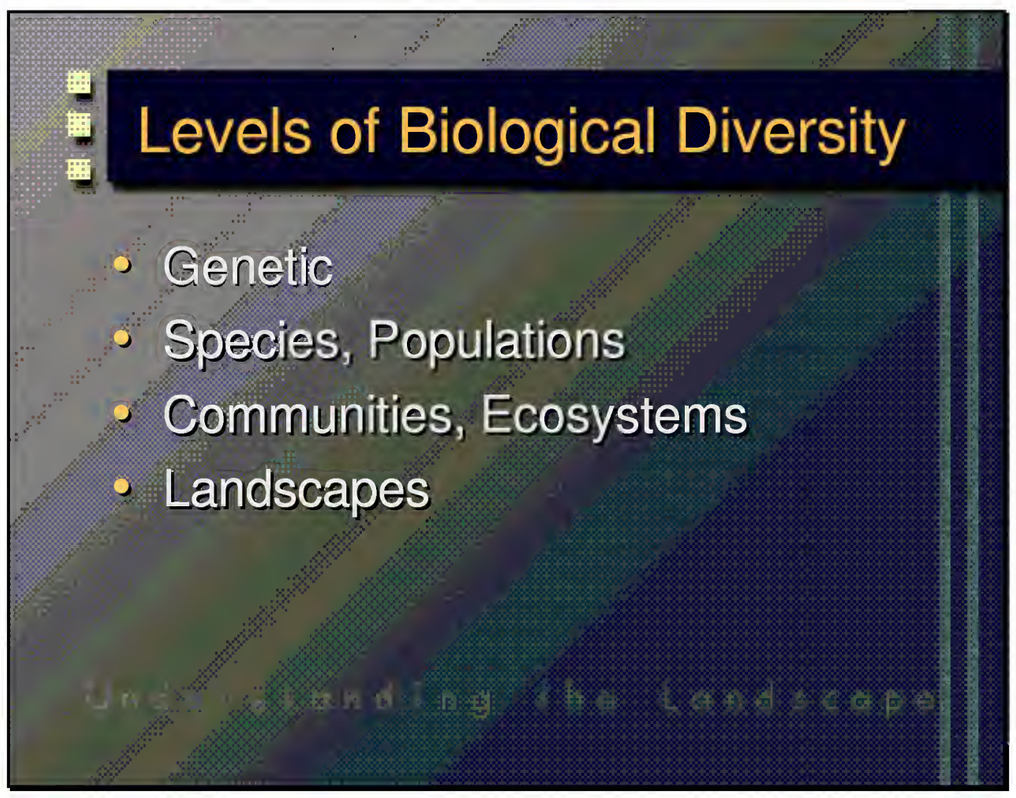

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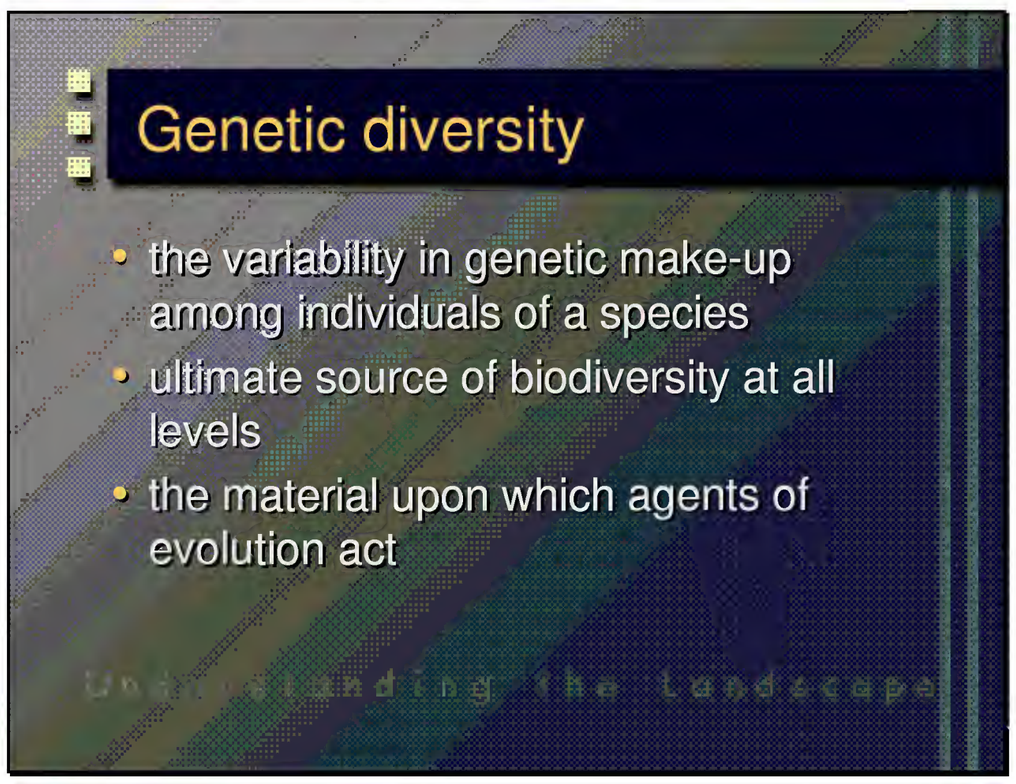

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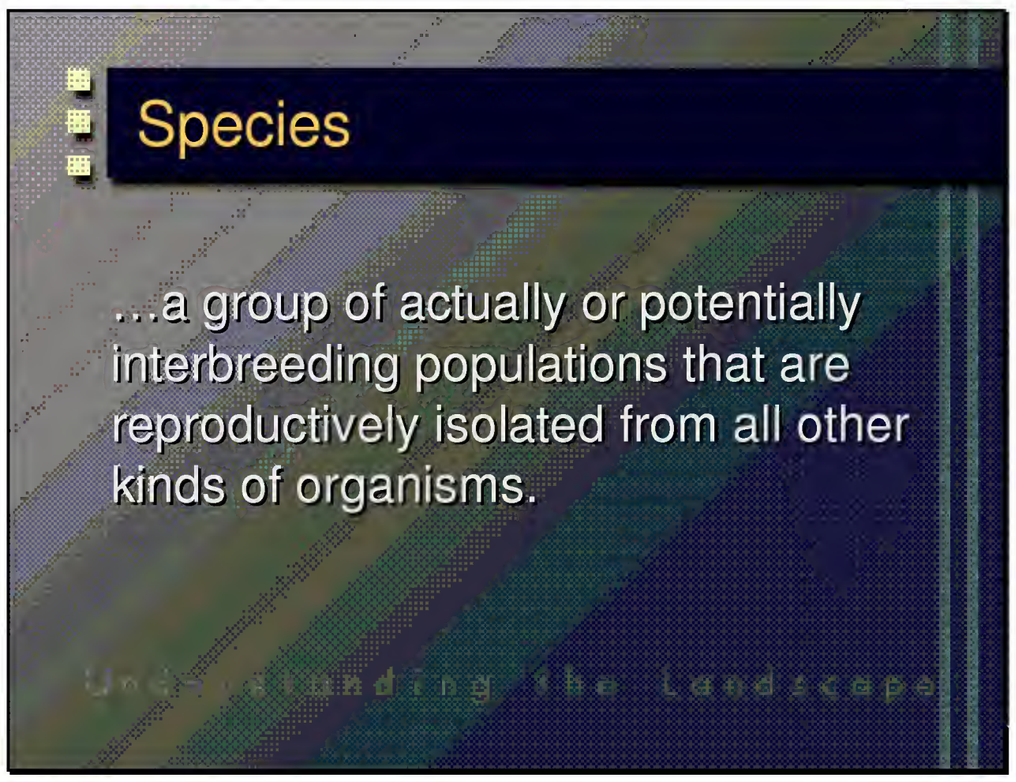

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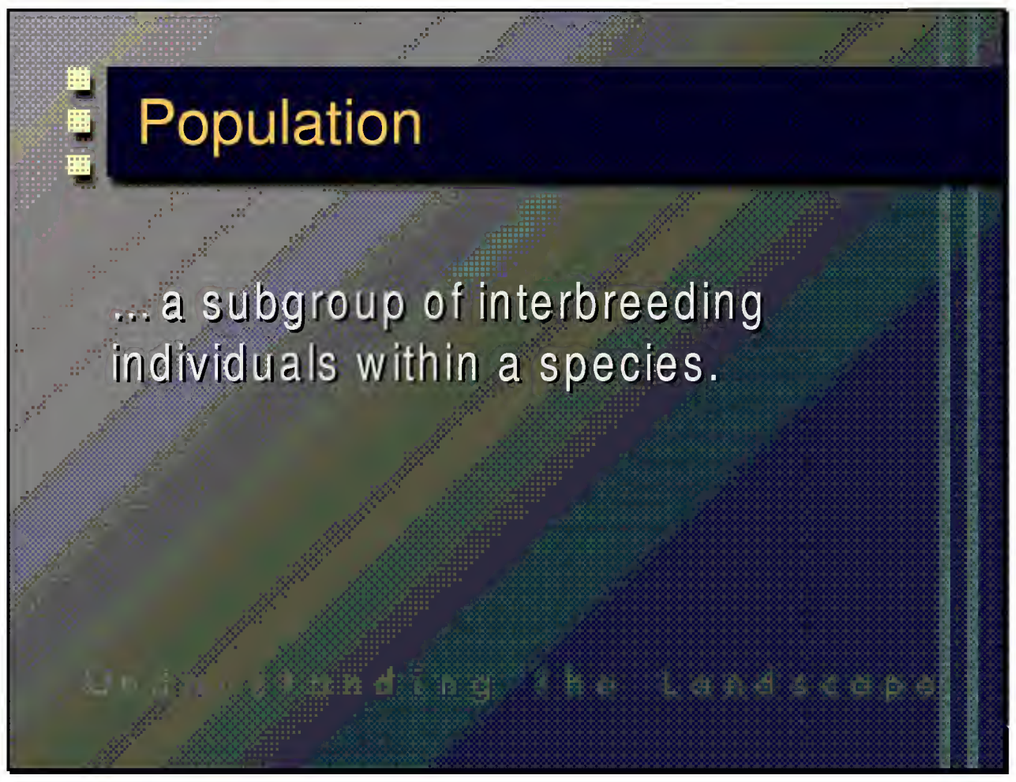

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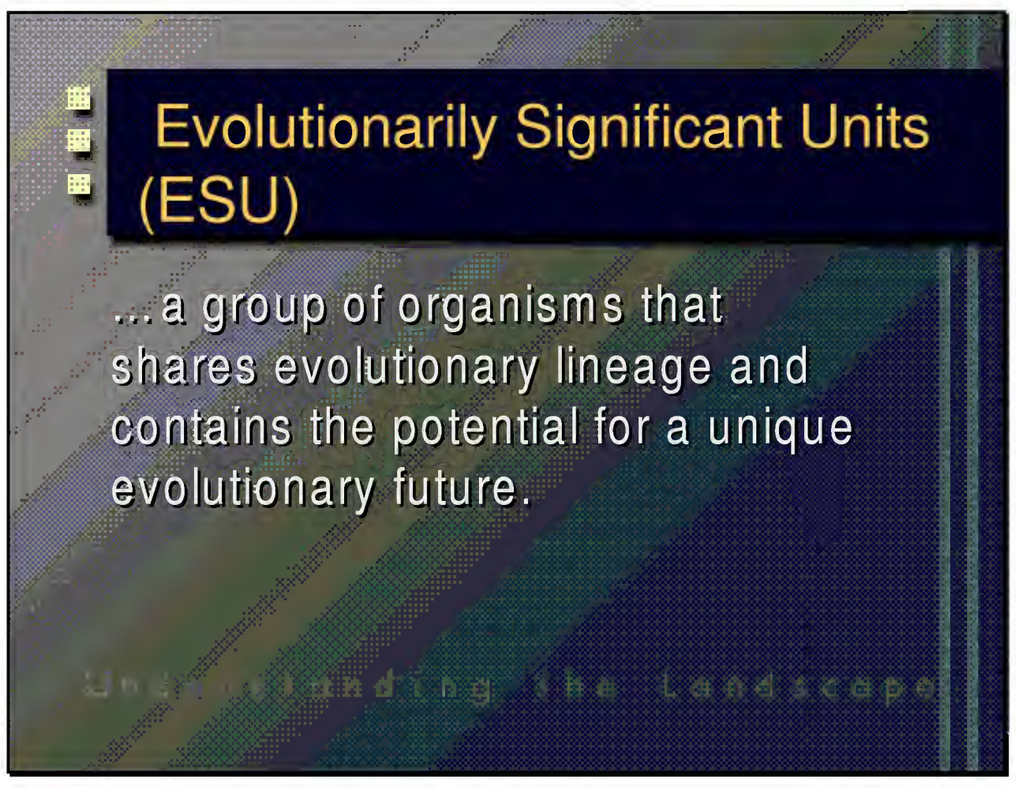

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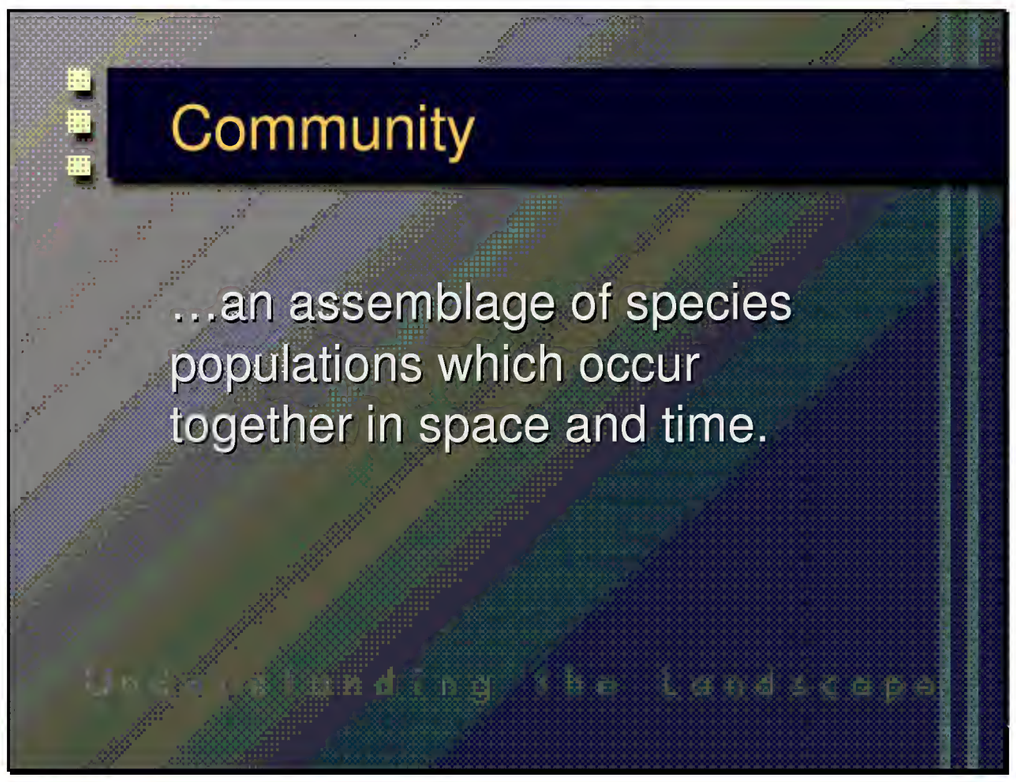

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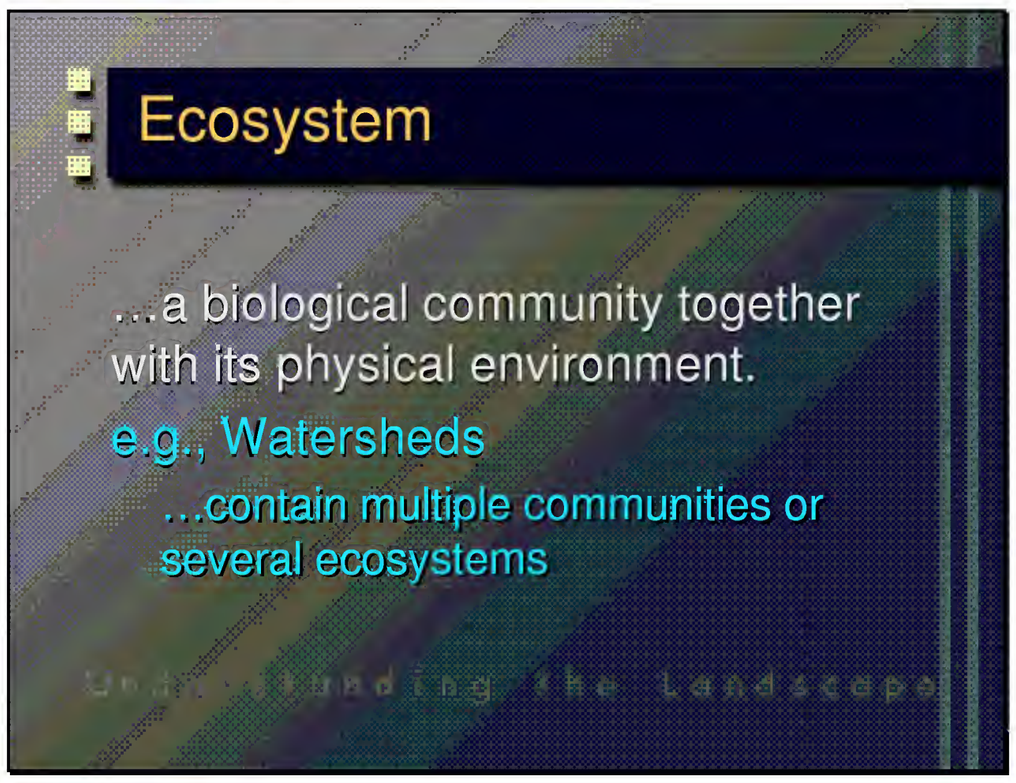

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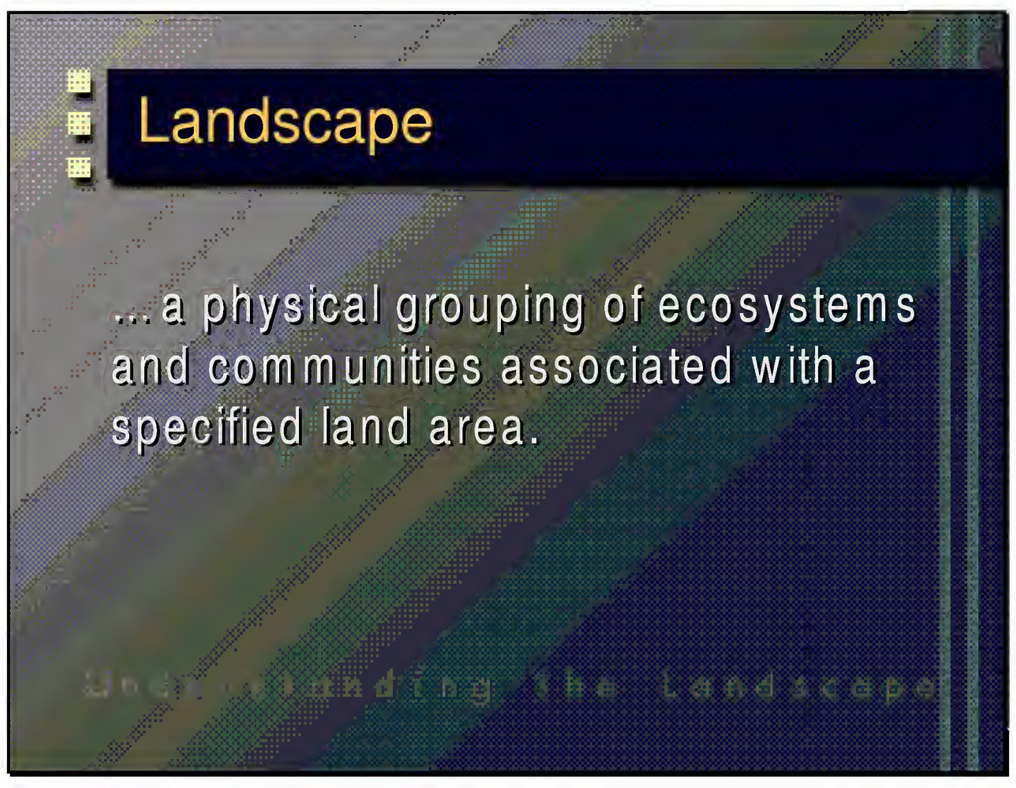

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How Many Species?

- Number of species identified:
  - 1.5 million
- Total number of species
  - …10 million…
    - …50 million…
      - …100 million…

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How many species?

Taxon	Described species	Estimate number	Percent described
Fungi	80,000	1,500,000	5.3
Vascular plants	250,000	500,000	50
Roundworms	20,000	1,000,000	2
Arthropods	1,250,000	20,000,000	5
Vertebrates	40,000	50,000	80

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Estimated loss in near future

- 20% of all species in the next 20 years
- 50% of all species within 50 years

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Reasons for species declines

- habitat loss and fragmentation
- introduced exotic organisms
- over exploitation
- natural causes

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What can land managers do?

- Think about how species are spread out globally
- Gain a better understanding of the landscape which will
  - lead to better stewardship of habitat
  - Help conserve species richness and biological diversity

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Factors in Species Richness

Geographic factors:

- Altitude
- Latitude
- Depth (aquatic species)

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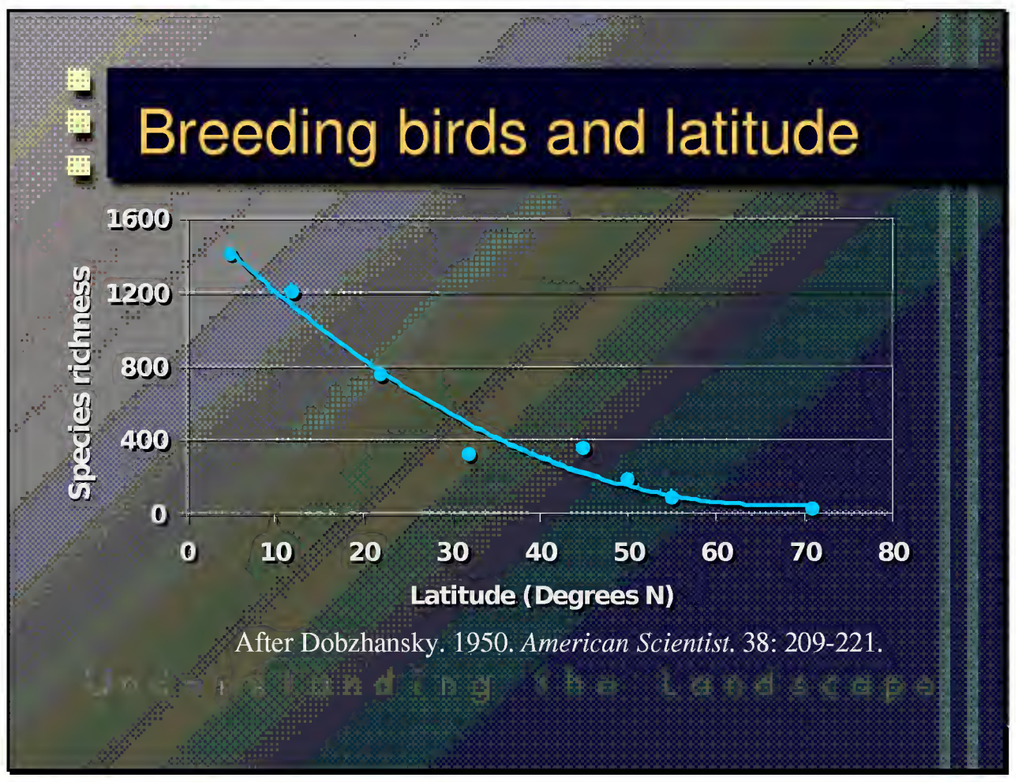

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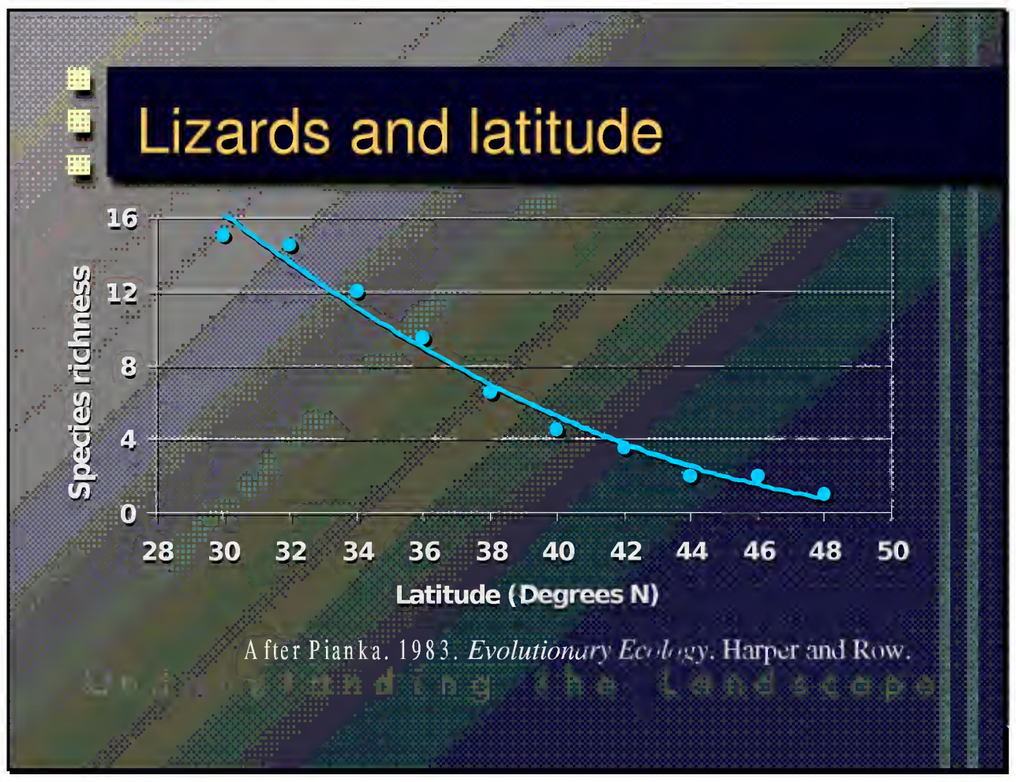

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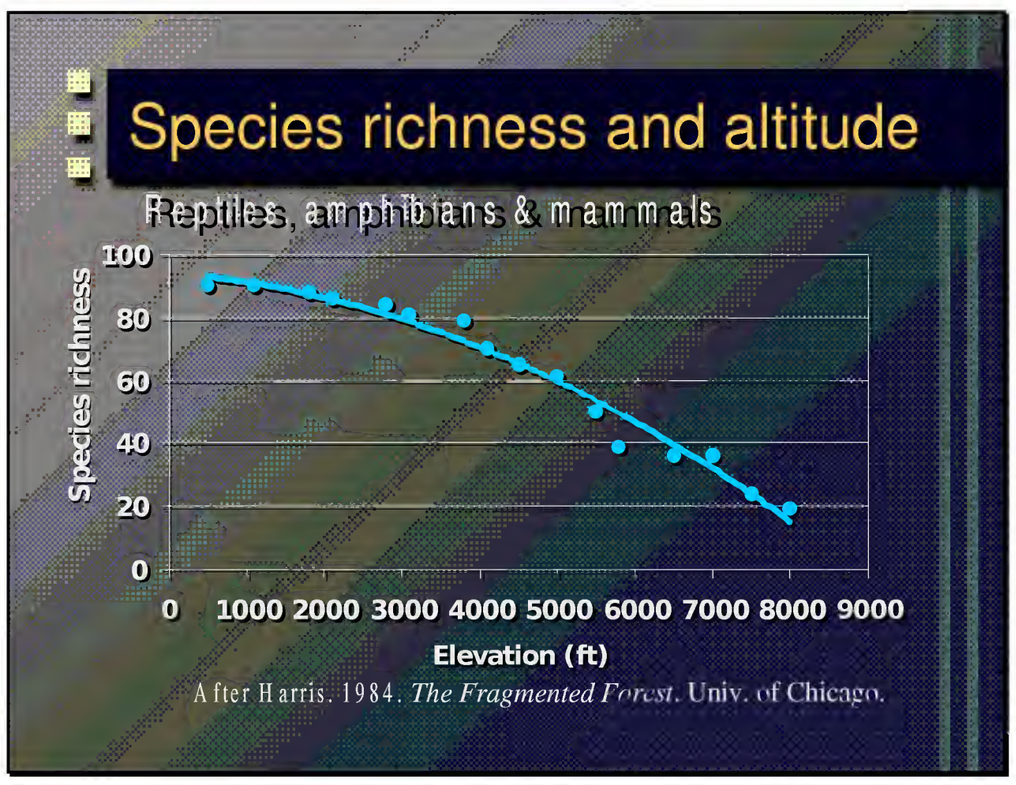

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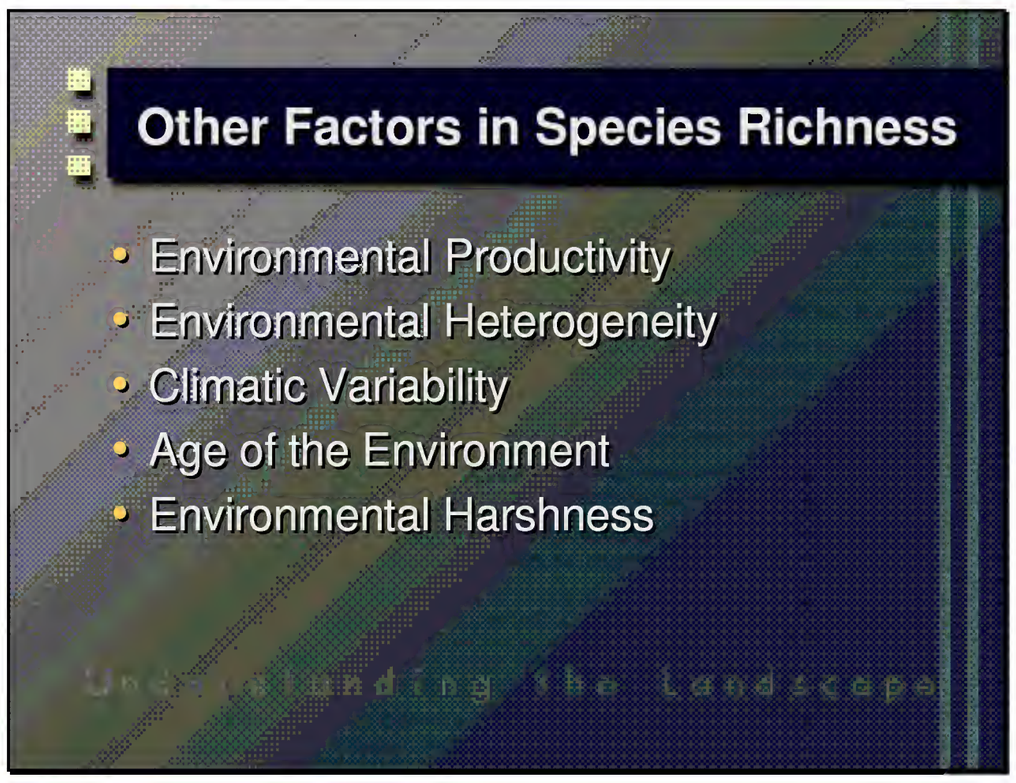

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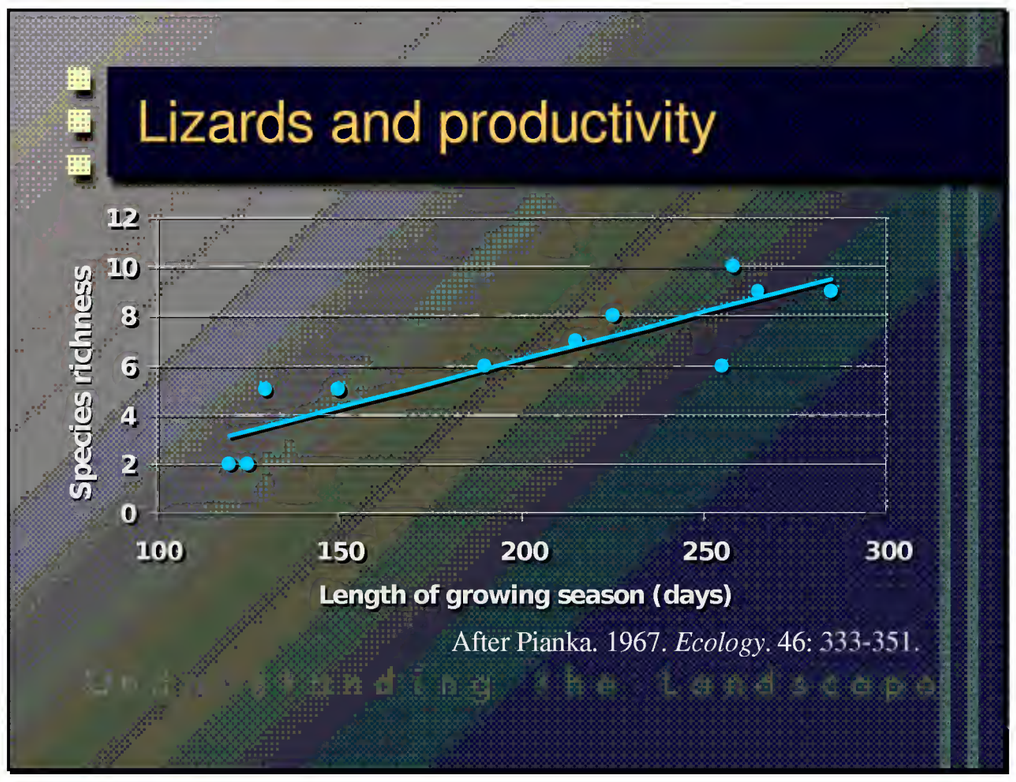

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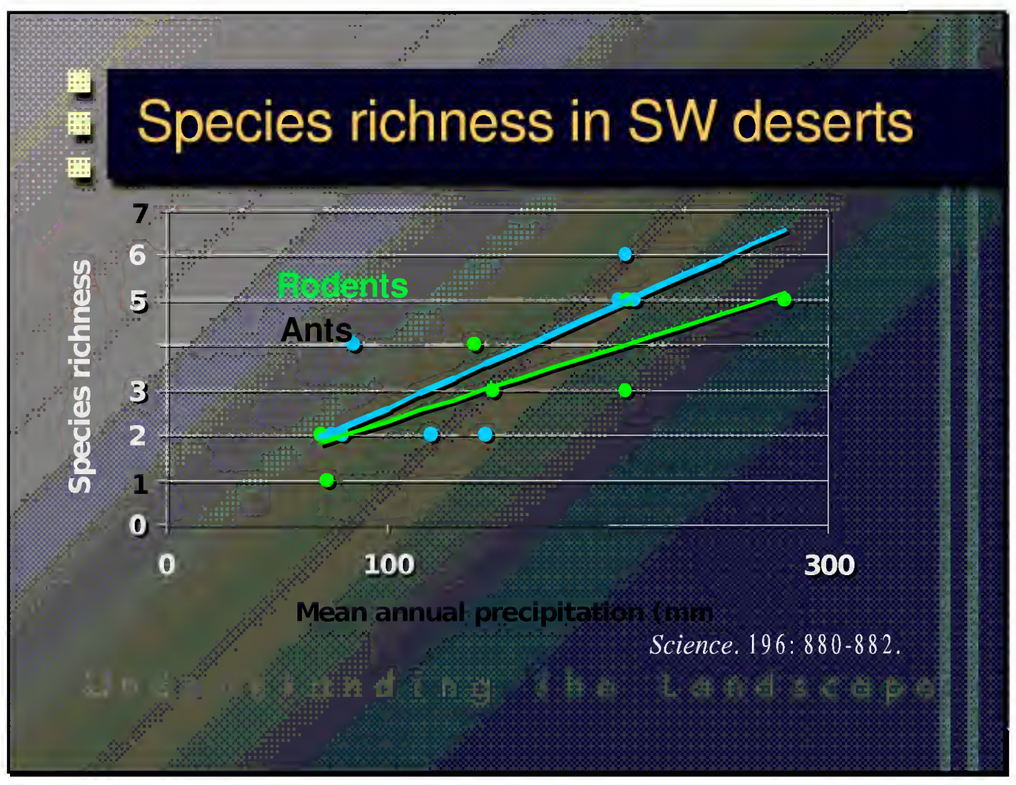

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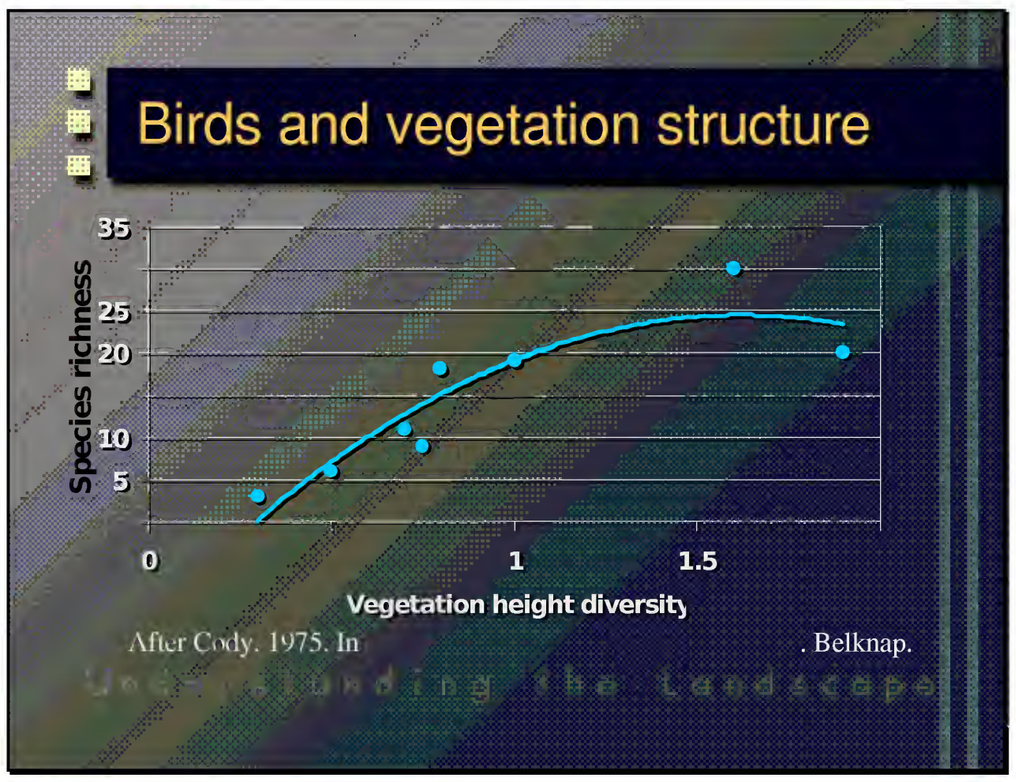

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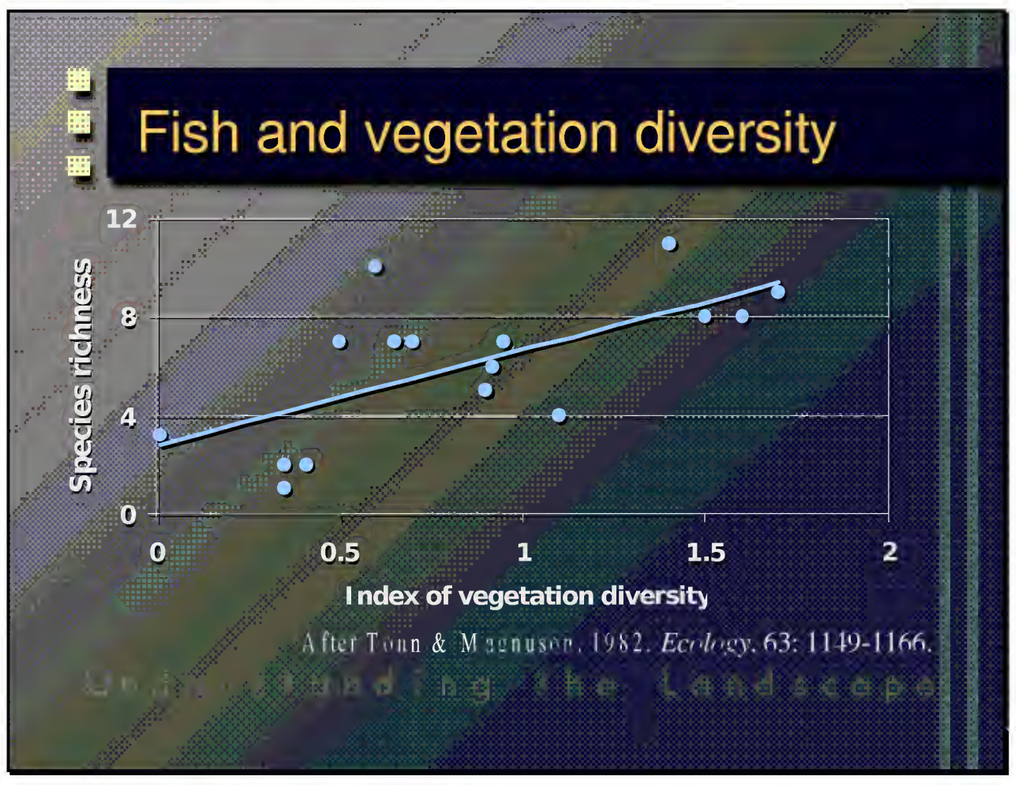

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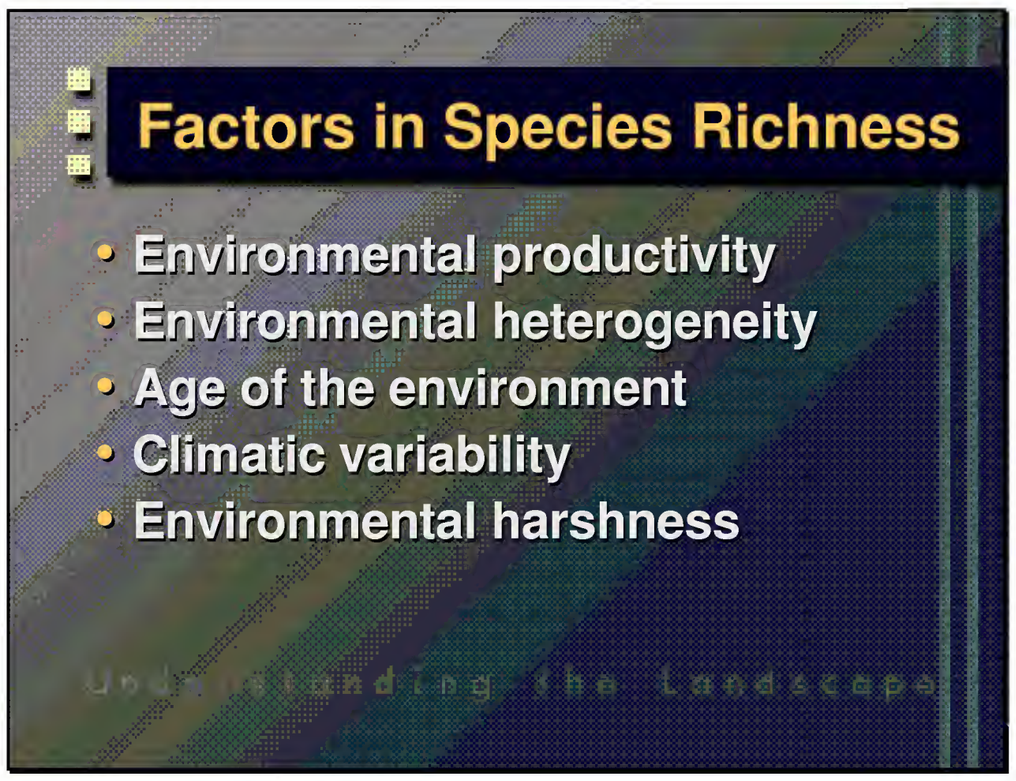

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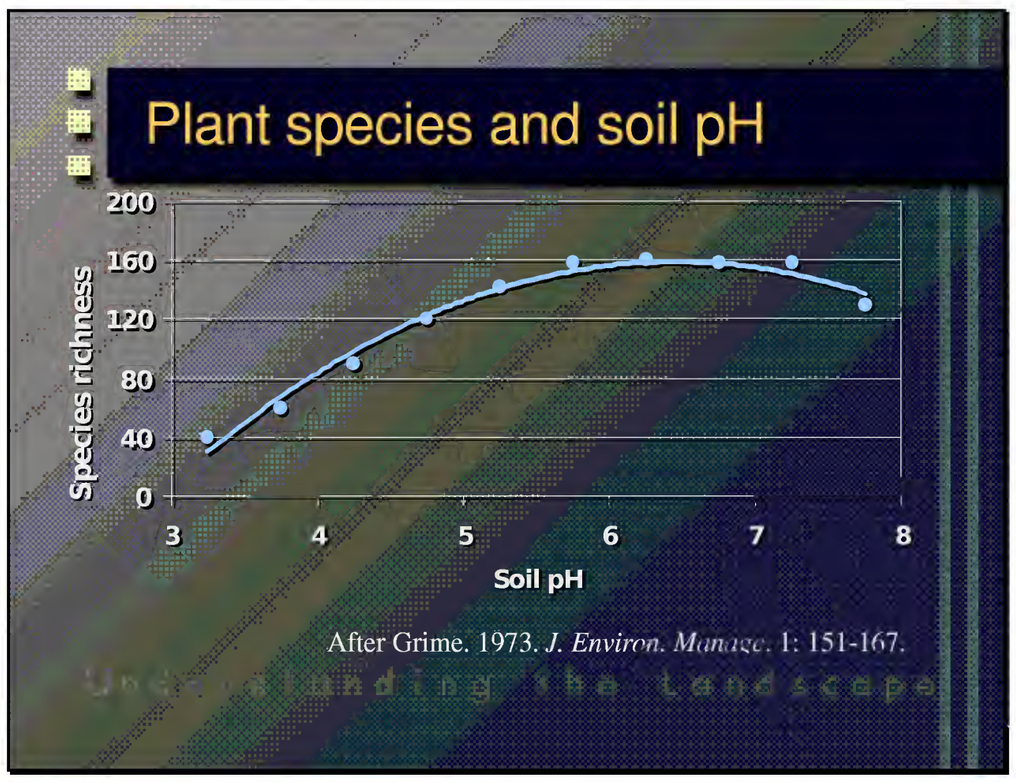

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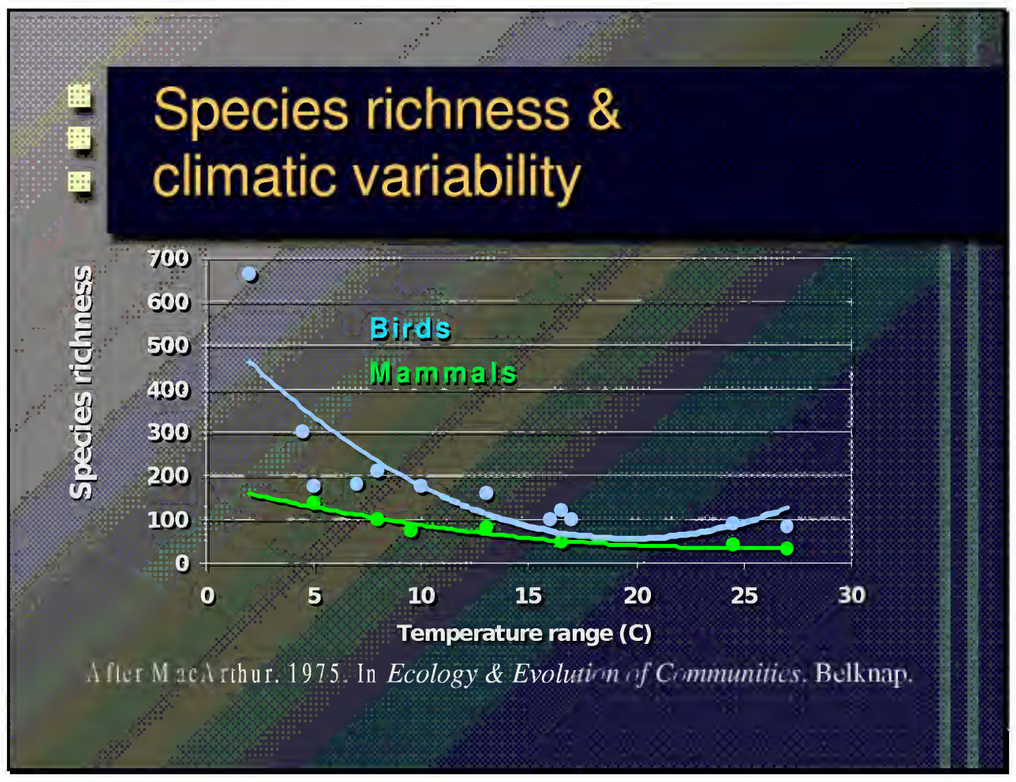

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